

DEVICE FOR PACKAGING ROLLS OF WEB MATERIAL IN AN AUTOMATIC  
PACKAGING MACHINE

TECHNICAL FIELD

The present invention relates generally to automatic machines for packaging different articles.

In particular, the present invention relates to a device for packaging rolls of web material, in an automatic packaging machine.

DESCRIPTION OF THE PRIOR ART

Known automatic machines for packaging rolls of web material, e.g. kitchen towels, toilet paper or other kinds of tissue paper, arrange more rolls in a single or double layer and in more rows, in compact form, and wrap them with a sheet of plastic material, e.g. polythene.

The rolls are packaged in a working station adapted to receiving the rolls.

The working station, in which the group of rolls is wrapped with a sheet, which forms also its wrapping, is situated between a line for feeding rolls to be packaged and an outlet line for the already packaged rolls.

The outlet line receives the packages from the station and completes the packaging by welding the edges and the heads of the wrapping sheet.

Essentially, the station wraps the rolls of paper and simultaneously transfers the rolls received from the feeding line to the outlet line, which is situated higher.

The feeding line can move vertically, so as to form groups with more layers of rolls, arranged one over another, usually two layers.

In known devices, the station includes essentially a group of elevators equipped with plates moving vertically, cyclically in opposite directions in phase relation with completion of the groups of rolls.

The plates, situated in a receiving area at the same level of the rolls feeding line, receive rolls which are to form a package and then move up to the level of the outlet line.

During the lifting, the group of rolls strikes against the sheet of plastic material, which is kept tightened by conveying belts along a trajectory followed by the plates, and pulls it upwards, thus becoming wrapped therein.

Folding members moves overlapping each other and inserting below the group of rolls, thus tucking in the free edges of the sheet, which remain placed one over another.

At the same time, the plates lower to receive other rolls.

Strikers are situated at the same level as the outlet line, arranged on the sides and at the top for holding the group of rolls together, with the sheet wrapped around them.

The machine is operated with always higher working speed in order to increase the number of packages obtained in the same operation time.

However, higher speed has caused considerable problems and functional disadvantages, because the pack or rolls detaches from the plate during the upward run, due to the rapid acceleration for rising.

Then, the group of rolls bounces against the top stop and causing a series of oscillations between the plate and the stop.

Consequently, the pack of rolls is not wrapped perfectly and the rolls can not maintain the best configuration which they have received when the group has been formed.

Therefore, the protective film of the finished package is not perfectly tightened and does not adhere to the rolls of the package, and the package tends to be loose at high speeds.

In order to avoid this problem, the operating speed of the raising group is increased gradually, so that the acceleration imposed to the rolls does not exceed the acceleration of the plate.

This prevents the rolls from being detached from the plate during almost the whole movement of the latter.

Nevertheless, due to obvious kinematic reasons, the speed of the plate during the final part of its run must be progressively reduced to avoid too rapid damages to the mechanism caused by too sudden stops with respect to the inertial masses involved.

Moreover, the constructive features and setup operation of the machine increase in complexity, because the steps and intervals between the movement of the plate and of folding means, as well as of possible operating means, must be respected.

The above mentioned complications affect the equipment construction costs as well as the subsequent maintenance costs.

Therefore, all the attempts made so far have not succeeded in resolving the problem of the rolls arrangement, with speeds still higher than those obtained at present due to the constructive and dynamic difficulties, ensuring at the same time high productivity with acceptable costs.

Another disadvantage of known devices derives from the presence of two stops and two changes of the trajectory imposed to the articles during the packages forming.

Due to this fact, the grouped articles must stop in the package forming station, must be subjected to a first

trajectory change upwards to raise the package, and then dwell again with a second trajectory change toward one of the sides, to let the formed package out.

#### SUMMARY OF THE INVENTION

The object of the present invention is to propose a device for packaging articles wound in rolls in an automatic packaging machine, which avoids all the above mentioned problems.

More precisely, the main object of the present invention is to eliminate the raising device and propose the station for packaging rolls without their vertical movement.

Another object of the present invention is to propose a station, which fulfils the above mentioned objects by an advantageous technical solution, which is easy to realize and setup, and which obtains higher working speed and rapider size changeover.

The above mentioned objects are fully obtained, in accordance with the contents of the claims, by means of a device for packaging rolls of web material in an automatic packaging machine, with the said machine including:

a station for forming packages of rolls;

a series of channels which supply said station with rolls, according to selected positions;

a receiving area of said station, situated at the same level as the series of channels and aimed at receiving and compacting said rolls, thus forming groups of rolls;

a predetermined outlet side of said receiving area, said groups of rolls leaving said receiving area through said outlet side;

a conveying line, aimed at taking over said groups of rolls already formed and leaving said receiving area;

first lateral means delimiting said receiving area on a side opposite to said outlet side;

lower delimiting means and upper delimiting means of said receiving area of said station, said lower and upper delimiting means including a pair of endless conveying belts parallel to each other and arranged one above another at adjustable levels;

moving means for moving said group of rolls out of said receiving area;

second lateral delimiting means situated near said outlet side and made movable to allow said group of rolls to leave while forming a package.

According to a different embodiment, the lower delimiting means and the upper delimiting means of said receiving area of said station, include a pair of surfaces, parallel to each other and arranged one above another at adjustable levels, with a lateral pusher for limiting, when set in a rest position, said receiving area on a side opposite to said outlet side, said lateral pusher acting on each group of rolls in order to make it leave said receiving area.

Lateral delimiting means are situated near said outlet side and made movable for allowing said group of rolls to leave said receiving area and form a package.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

The characteristic features of the present invention will be pointed out in the following description of a preferred, but not unique embodiment, with reference to the enclosed tables of drawings, in which:

- Figure 1 is schematic top view of the proposed station;
- Figure 2 is a lateral view of the proposed station of Figure 1 according to a first embodiment, with some

elements removed to point out the characteristic features of the invention;

- Figures 3, 4, 5, 6 are lateral views of the station of Figure 2 in different subsequent working steps;
- Figure 7 is a lateral view of the proposed station of Figure 1 according to a second embodiment, with some elements removed to point out the characteristic features of the invention;
- Figure 8 is a view of a simplified variant of the invention.

#### DETAILED DESCRIPTION OF THE INVENTION

With reference to the above drawings, Figure 1 is a schematic, top view of the device for packaging articles wound in rolls, according to the present invention.

The device is a part of an automatic packaging machine, generally of known type, thus not shown and not described.

The machine includes, among other not shown means, a station 1 for defining packages 5 of rolls R8, R9...Rn, substantially like stations on known machines.

The rolls concerned are paper rolls, e.g. kitchen towels, toilet paper or another type of absorbent or tissue paper.

It is understood that the invention described in the following can be used also with articles different than paper, or if the form of the articles is different from rolls, obviously after having applied some necessary changes.

A series of channels C2, C3...Cn, feed the station 1 with the rolls R8, R9...Rn, according to selected positions.

This means that the position of the channels defines the position, in which each roll is placed in a predetermined area Z, where the rolls are collected and compacted.

Figure 1 shows four channels as an example. Therefore, it is possible to obtain groups up to four rolls, in one or more layers arranged one over another.

The arrangement one layer over another is obtained by known techniques and devices, in particular by cyclical vertical movement of the channels.

Therefore, this technical feature is not illustrated and described.

The group of rolls formed in the area Z is indicated with 4 in Figure 1.

The area Z is delimited at the back by a motionless wall, not shown for simplicity's sake, and one of its sides, indicated with 14 in Figure 2, is aimed at letting the already formed groups 4 out.

Means for positioning a sheet 19 of packaging material (polythene or paper) for wrapping the group of rolls 4, are situated near the outlet side 14 and behind the second lateral delimitation means 11.

Besides the sheet 19 positioning means, not shown as of known type, there are two folding plates 26, 27 situated one above another and staggered, which are move to overlap each other and place themselves behind the package 5 formed by the group 4 just gone out from the area Z, to overlap the free edges of the sheet 19 and weld them.

The two plates 26 and 27 are situated directly behind the sheet 19, considering the groups 4 movement direction.

The means operating the plates 26 and 27 are not illustrated and described since of known type and easy to realize by an expert in the field.

A conveying line 6, situated near the outlet side 14, includes e.g. two conveying belts 7, of known type, parallel

to each other and arranged one over the other at an adjustable distance.

The conveying line 6, not described in detail, is aimed at receiving the formed groups of rolls and conveying them, while the folding plates 26, 27 complete the wrapping closure by heat-welding the overlapped edges of the rolls wrapping sheet.

First lateral delimitation means 23 of the area Z, situated on the side 15 opposite to the outlet side 14 of the station, have different configurations described in detail later on.

Lower delimiting means 16 restrict the area Z of the station 1 from the bottom and upper delimiting means 17 restrict the area Z from the top.

According to the invention, the lower and upper means delimiting the area Z are formed by a pair of endless conveying belts 16, 17, parallel to each other and arranged one above another at different levels. This allows to adjust the package wrapping tension.

Displacing means 16, 17; 24, 25 act on the group 4 of rolls formed in the area Z, so as to make it leave the area Z.

According to a first embodiment of the invention, the endless conveying belts 16, 17 are operated intermittently and in phase relation with the defining of groups 4 of rolls in the area Z, and they constitute the displacing means.

The operating speed of the belts 16 and 17 can be advantageously changed.

In order to form a package correctly, the belts 16, 17 can be moved vertically, rising and lowering.

According to another embodiment of the invention, the endless belts 16, 17 are idle or operated in phase relation with the defining of groups 4 of rolls, and the displacing means are formed by a lateral pusher 24, 25, which, while in rest



position, acts also as first delimiting means 23 on the side 15, opposite to the outlet side 14 of the groups of rolls 4.

According to a further, simplified embodiment, the belts 16, 17 are substituted by two surfaces 66, 67, whose height is adjustable, so that they adapt to different sizes of the articles to be packaged and so that the tension of the wrapping can be changed.

This simplified embodiment has been shown schematically in Figure 8.

According to a first embodiment of the pusher 24, indicated with 24 in Figures from 2 to 6, the pusher reciprocates in opposite directions, namely a first direction CS, to move the group 4 out of the area Z, and then in a direction TP, which defines the return trajectory.

It is possible to clear the area Z more rapidly and to allow quicker definition of a new group 4 of rolls, thus increasing the operation speed, by moving the pusher, indicated in this case with 25, along a close loop following the sides of a quadrangle, so as to move laterally after having pushed a group of rolls 4 out of the area Z.

This way it is possible to clear the area Z, so as to define a new package 5 of rolls R8, R9...Rn, while the pusher 25 is returning following a parallel trajectory TP, shifted with respect to the trajectory CS of displacement of the group 4 of rolls.

The structure and mechanisms necessary to realize the second embodiment of the pusher have not been illustrated and described in detail, because they are easy to understand and manufacture by an expert in the field.

Second delimiting means 11 are situated in the region of the outlet side 14 of the groups of rolls 4, to restrict laterally the area Z, in which the rolls R8, R8...Rn are collected and

compacted, allowing however the groups of rolls 4 to leave in order to define the packages 5.

According to a simpler form, not shown, the second delimiting means 11 include at least one swinging wall 12, hinged to one of the edges of the outlet side 14 of the area Z, where the groups of rolls 4 are defined, usually the lower edge.

The wall 12, swinging downwards, joins with the conveying line 6, and forms a joining surface which allows the group of rolls 4 to go out.

The wall 12 can extend along the whole width of the outlet side or only along a part of it.

According to a more complete and functional embodiment, the second delimiting means 11 include two swinging walls 12, 13, arranged one above the other and hinged to two opposite edges of the outlet side 14 of the area Z, where the groups of rolls 4 are formed.

The extension of both walls advantageously covers the whole, or at least the major part of the outlet side 14.

In other words, also in this case, the two walls 12, 13 swing outwards and join with the conveying line 6 thus forming a joining surface, which allows the group of rolls 4 to go out.

Therefore, the walls 12, 13 constitute the continuation of the surfaces formed by the active runs of the belts, which support and guide the pack of rolls and maintain their correct arrangement.

Operation of the proposed device will be described in the following with reference to Figures from 2 to 6.

The channels C2, C3...Cn supply the necessary number of rolls R8, R9...Rn to the area Z, where they are ordered and compacted.

Possibly, the channels are moved upwards and form a second layer of rolls.

In the meantime, a sheet 19 of plastic material, e.g. polythene, is disposed near the outlet side 14 of the area Z (Figure 2).

When the group of rolls 4 is completed, the walls 12 and 13 open and the pusher 24 is operated (Figure 3) to push the group 4 out of the area Z.

According to the variant with the active belts 16 and 17, the pusher is substituted by a motionless wall and the active belts 16 and 17 are operated instead of the pusher.

This way, the group 4 strikes against the sheet 19 and is thus wrapped therein (figure 4).

When the whole group 4 is between the belts 7 of the conveying line 6, the pusher begins its return stroke TP (Figure 5).

At this point, the walls 12, 13 close and the plates 26, 27 are placed side by side behind the already formed package 5 in order to overlap the edges of the sheet 19 (Figure 6).

The package 5 is then moved to the conveying line 6, and meanwhile the closing of the wrapping is completed by the folding plates 26, 27.

The last operation has not been illustrated and described, as substantially similar to the analogous operation performed by known machines.

According to the embodiment of the pusher of Figure 7, the pusher 25 rises or moves laterally when its stroke CS is completed and returns to the beginning point along a parallel and offset trajectory TP, so as to allow to prepare contemporarily another group of rolls 4, which can be moved by a second pusher 25, which moves likewise.

It is evident that all the objects described in the introduction has been obtained.

In particular, there are no more problems with the rolls arrangement caused by jerks during the rolls movement.

This is due to the fact that the groups of rolls are no longer moved vertically, as it happened with known machines and all the movements occur without obstacles.

Moreover, one stop and one change of trajectory have been eliminated, because immediately after having formed the package, the rolls are sent along the outlet line.

Also the phase problems related to the alternate vertical movement of the plates have been eliminated.

Further, in case the pusher, in all its embodiments, is used, there are no problems related to gravity because the movements are horizontal, not vertical, which allows an easier timing and control of the phases.

The size changeover results extremely easy, as it is only necessary to act on positioning of the belts without changing the plates and devices connected thereto.

All what above, results in lower costs of the machine production, as the design, construction and attitude are easier.

In case of active conveying belts, the lack of the pusher reduces the costs, increases the speed and improves the performance, as far as quantity as well as quality are concerned.

It is understood that what above, has been described as a pure, unlimited example, therefore, possible variants of the invention remain within the protective scope of the present technical solution, as described above and claimed hereinafter.